ELGIN O'HARE
WEST BYPASS

communities. opportunities. solutions.

# Elgin O'Hare – West Bypass EIS $PM_{2.5}$ Hot Spot Analysis

## Presented to CMAP

## CH2M HILL 3/13/2012

Illinois Tollway

Illinois Department of Transportation

# Elgin O'Hare – West Bypass Project

- **Identified as project of regional and national significance**
- **Tiered EIS process**
- **Governor's Advisory Council**
  - Collaborative group advised Governor on financing, sustainability, diversity, and economic benefits of EO-WB in Final Report June 2011
- **Illinois Tollway identified EO-WB in capital improvement (*Move Illinois*)**
  - Dedicated funding
  - Construction to begin 2013 and extend through 2025

| Sustainability | Economic | Diversity | Financing |
|---|---|---|---|
| • **Green Power**<br>• **Water Quality**<br>• **Construction Incentives** | • **41,000 long-term jobs**<br>• **$6 B added to regional economy** | • **Create program to develop, assist & monitor** | • **Finance and operate as a Tollway**<br>• **Phase Implementation** |


# Overall Plan

# Tier Two Build Alternative


## LEGEND

- System Interchange
- Full Local Access Interchange
- Split Local Access Interchange
- Partial Local Access Interchange
- Bus Shuttle Service
- Existing Transit Station
- Proposed Transit Station
- Transit Improvement
- Arterial Improvements
- Mainline Improvements
- Roadway with No Improvements

N

# Purpose of Analysis

- **Project of air quality concern**
  - Annual $PM_{2.5}$ nonattainment
  - Highway project with significant number of diesel vehicles
  - Hot Spot Analysis is required to demonstrate project-level conformity
- **Starting in December 2012, quantitative analysis required for PM hot spot analysis**
- **Until December 2012, quantitative or qualitative analysis is acceptable**
- **Interagency workgroup decided this project is a good candidate for a quantitative analysis**

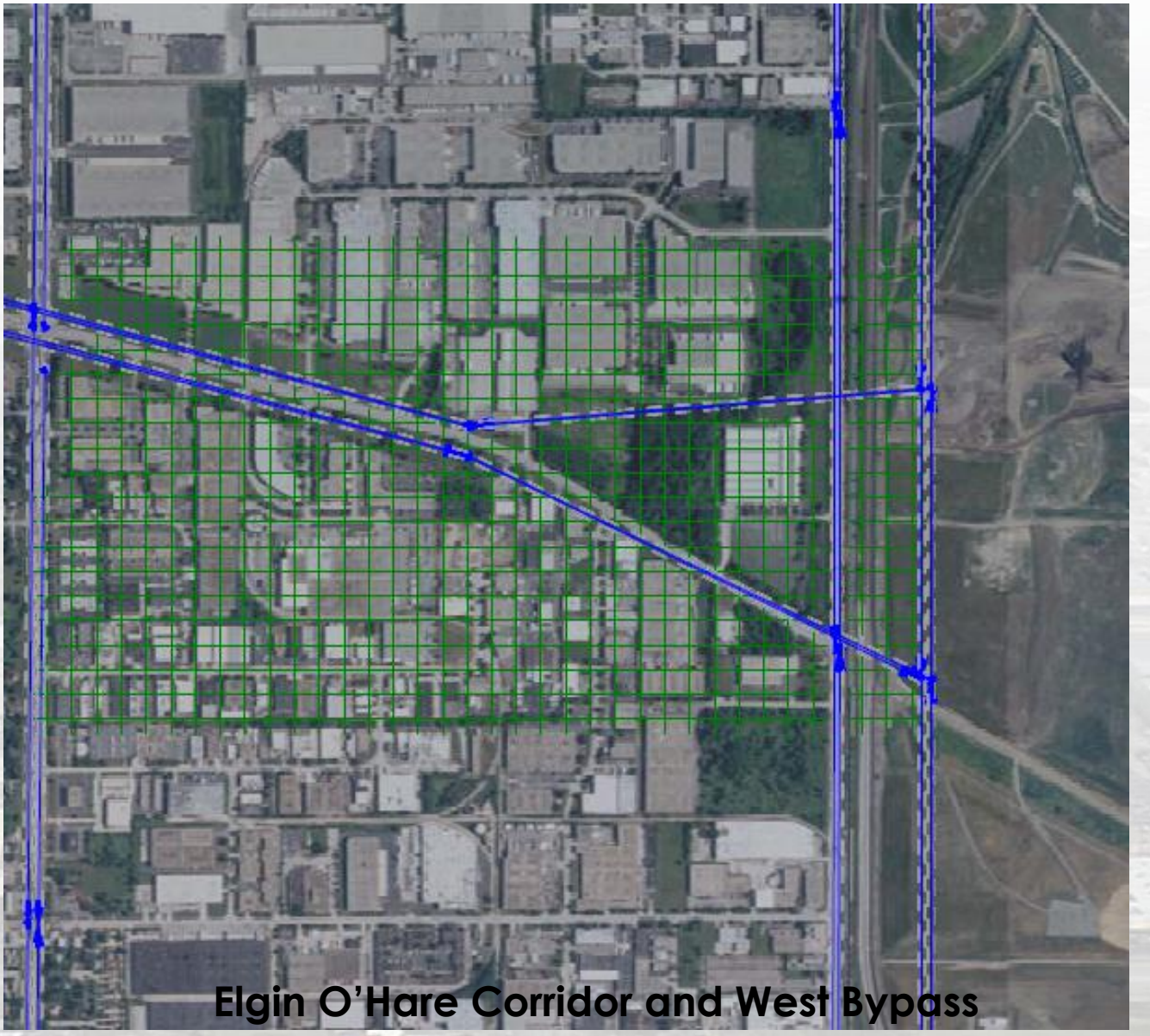
# Original Submitted Analysis – Methodology

- **Entire project should be modeled, but large projects can analyze locations within project area expected to have highest pollutant concentrations**
  - Elgin O'Hare and West Bypass corridors
  - Elgin O'Hare corridor and I-290
  - Elgin O'Hare corridor and Roselle Road
  - West Bypass corridor and I-90
- **Must analyze years of peak emissions within transportation plan**
  - 2040: last year of regional transportation plan
  - 2030: peak capacity after completion of initial construction phase

# Original Submitted Analysis – Methodology (continued)

- **Emissions estimated using MOVES**
  - Local fuel, vehicle mix, registration mix from MOBILE6 files provided by IEPA
  - Average speed by functional class
- **Concentrations estimated using CAL3QHCR**
  - Project represented as a series of line sources
  - Main source inputs are volumes from traffic forecasting and emissions from MOVES
  - 5 years of local meteorological data

# Example Model Setup



Elgin O'Hare Corridor and West Bypass

# Original Submitted Analysis - Results

Annual $PM_{2.5}$ Concentrations ($\mu g/m^3$)

| Location | 2040 No-Build | 2040 Build | 2030 Interim Year Build |
|---|---|---|---|
| Elgin-O'Hare Expressway & West Bypass | 13.2 | 14.0 | 14.3 |
| Elgin-O'Hare Expressway & I-290 | 13.8 | 13.5 | N/A |
| Elgin-O'Hare Expressway & Roselle Road | 13.4 | 13.4 | N/A |
| West Bypass & I-90 | 13.8 | 13.6 | N/A |

- All results include background concentration of 13 $\mu g/m^3$
- Results shown are for the maximum modeled receptor
- 2030 results are based on a combination of 2030 emission factors and 2040 vehicle volumes

# FHWA Comments – Interim Year

- **Clarify why the year 2030 was selected for analysis**
  - 2030 represents year of peak emissions after completion of initial construction phase
- **All years must undergo the same level of analysis**
  - Use traffic forecasting data from 2030 and emission factors from 2030
  - Model all 4 interchanges for 2030
  - 2030 Modeling revised

# FHWA Comments – Meteorological Data

- **Was Peoria upper air station the appropriate upper air data for this project site?**
  - Yes. IEPA advised latitude is more critical than proximity to water.
- **Was 1986-1990 meteorological data recent enough for this analysis?**
  - Yes. Readily available for public use.
  - Meets EPA criteria: 5 consecutive years of most-recent readily available data

# FHWA Comments – Hourly Vehicle Volume

- Text suggested that hourly vehicle volumes were derived from average daily vehicle volumes
- Hourly vehicle volumes were provided by traffic analysts for AM peak, PM peak, mid-day and off-peak
- Modeling analysis was not changed
  - Text updated
  - Hourly volume data provided for review

# FHWA Comments – Average Vehicle Speed

- **Was the use of aggregate average vehicle speeds appropriate for this analysis?**
  - Yes. Small variability variation throughout project area, and small directional variability
  - Modeling analysis was not changed
  - Example of 2040 Build aggregate speeds:

**Average Speeds by Functional Class in Miles per Hour**

| Scenario | Functional Class | AM Peak | PM Peak | Mid-Day | Off-Peak |
|---|---|---|---|---|---|
| 2040 Build | Freeway | 33 | 41 | 44 | 52 |
| | Principal Arterial | 37 | 37 | 42 | 46 |
| | Minor Arterial | 27 | 27 | 32 | 42 |
| | Collector | 27 | 29 | 33 | 37 |

# FHWA Comments – Justification of Other Assumptions

- **FHWA requested justification of model input assumptions**
  - Examples: describe how segments were determined, clarify if signalized intersections were included, justify use of 0% grade in MOVES and flat terrain in CAL3QHCR
- **Modeling analysis was not changed**
- **Text was revised to include more details**

# Revised Analysis Results

- 2040 analysis not revised
- 2030 Build analysis given same level of evaluation as 2040 Build analysis

Annual $PM_{2.5}$ Concentrations ($\mu g/m^3$)

| Location | 2040 No-Build | 2040 Build | 2030 Interim Year Build |
|---|---|---|---|
| Elgin-O'Hare Expressway & West Bypass | 13.2 | 14.0 | 13.8 |
| Elgin-O'Hare Expressway & I-290 | 13.8 | 13.5 | 13.6 |
| Elgin-O'Hare Expressway & Roselle Road | 13.4 | 13.4 | 13.4 |
| West Bypass & I-90 | 13.8 | 13.6 | 13.8 |

# Conclusion of Quantitative PM2.5 Hot Spot Analysis

- **Project-level conformity is demonstrated**
  - Project does not cause or contribute to a violation of the annual $PM_{2.5}$ NAAQS

# Challenges of Analysis

- **New Guidance**
  - Domain not well-defined
  - Example projects much simpler than this project
  - Limited guidance about background concentration
- **New Model**
  - MOVES is powerful, but not all features are appropriate for this level of analysis
  - Current design is cumbersome for project-level purposes
  - Generates many files that must be submitted for review
- **Using an old model in a new way**
  - CAL3QHCR input limitations
  - Meteorological processor no longer supported by EPA

# Lessons Learned

- Detailed documentation is critical
- Get agreement on assumptions early
- Go to trainings and stay up to date on developments
- Don’t underestimate the effort it takes to run new models

# ELGIN O'HARE WEST BYPASS

communities. opportunities. solutions.

## Questions?

Illinois Tollway

Illinois Department of Transportation